Tex-206-F, Compacting Test Specimens of Bituminous Mixtures

Overview

Effective date: August 1999 to October 2004.

This method is used to provide a procedure for compacting test specimens of bituminous mixtures using a Texas Gyratory compactor molding press.

Apparatus

The following apparatus is required:

- motorized gyratory-shear molding press, calibrated according to Test Method "Tex-914-K, Calibrating Motorized Gyratory-Shear Molding Asphalt Press"
- molding assembly, consisting of gyratory-shear mold, base plate, and wide-mouthed funnel
- a balance readable to 0.1 g and accurate to 0.5 g
- mercury thermometer, capable of measuring the temperature in the test procedure marked in 2.5 °C (5 °F) divisions
- sieve, 22.4 mm (7/8 in.)
- flexible spatula having a blade 100 mm (4 in.) long and 20 mm (0.75 in.) wide
- large bent spoon
- micrometer dial assembly or calipers.

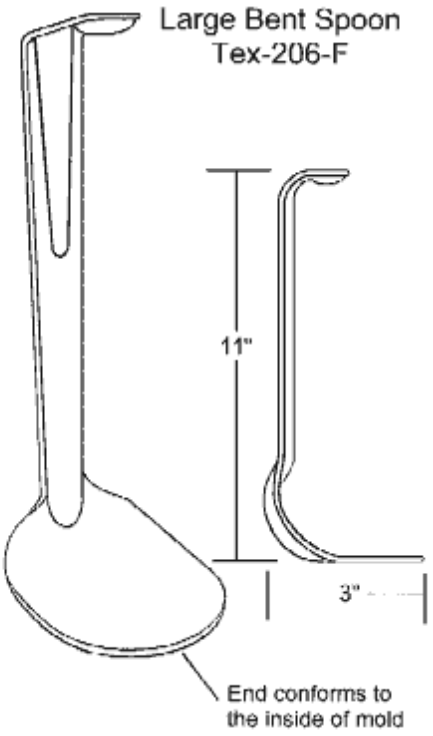
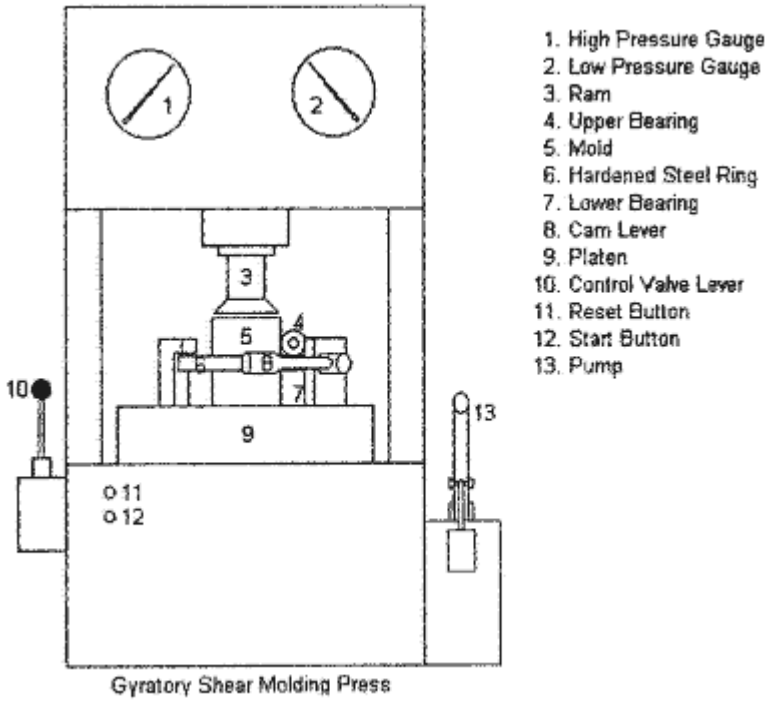


Figure -1. Large Bent Spoon.



Figur e-2. Gyratory Shear Molding Press.

Procedure

Follow these steps for compacting test specimens of bituminous mixtures. Equipment used in this procedure must meet the requirements of Test Method "Tex-237-F, Minimum Standards for Acceptance of a Laboratory for Hot Mix Testing."

The curing and molding temperature of 121 °C (250 °F) is for asphalt grades referenced in Test Method "Tex-205-F, Laboratory Method of Mixing Bituminous Mixtures." For asphalts containing viscosity modifying additives, consult the binder supplier or CSTM's Asphalt Branch for appropriate curing and molding temperatures. The same temperature should be used for both curing and molding of these binders.

Compacting Test Specimens of Bituminous Mixtures

Step	Action
1	Combine aggregates and prepare laboratory bituminous mixture as described in Test Method "Tex-205-F, Laboratory Method of Mixing Bituminous Mixtures." ♦ For mixture design samples of hot mix asphaltic concrete containing absorptive aggregate, the laboratory mixtures will be cured at 121 ± 3 °C (250 ± 5 °F) for two hours prior to molding. ♦ If the anticipated plant storage temperatures are believed to cause more asphalt absorption than the 121 °C (250 °F) temperature, the anticipated storage temperature may be used for this curing period.
2	Cool (or heat) the samples to 121 ± 3 °C (250 ± 5 °F) prior to molding. ♦ Show any curing temperature other than 121 ± 3 °C (250 ± 5 °F) on the mixture design report.
3	Bring samples of hot mix asphaltic concrete taken from plant production to a temperature of 121 ± 3 °C (250 ± 5 °F) prior to molding. ♦ If asphalt absorption by the aggregates required an adjustment of density values during the laboratory mixture design hold the loose sample at the mix design curing temperature for two hours prior to molding. ♦ When a mixture contains relatively non-absorptive aggregates, the sample may require a short holding period at 121 ± 3 °C (250 ± 5 °F) to allow the escape of small amounts of moisture still in the sample. ♦ All hot mix asphaltic concrete mixtures which contain asphalt cement are compacted into test specimens at a temperature of 121 ± 3 °C (250 ± 5 °F) unless the asphalt cement contains viscosity modifying additives. ♦ The Asphalt Branch of CSTM will assist in determining the appropriate molding temperature in these cases.
4	♦ Place hot-mix, cold-laid mixtures in an oven and cure to constant weight at a minimum temperature of 60 °C (140 °F) to remove moisture and/or hydrocarbon volatiles. ♦ Cure and dry limestone rock asphalt mixtures to constant weight at a temperature of 88 ± 5 °C (190 ± 10 °F) with frequent stirring. ♦ Mold specimens of hot- mix, cold-laid mixtures and limestone rock asphalt mixtures after cooling to a temperature of 38 ± 3 °C (100 ± 5 °F). NOTE: On some projects that specify 'Hot-Mix, Cold-Laid Asphaltic Concrete' the engineer may choose to place the mixture 'hot,' omitting the addition of water and primer. In these cases, mold the Hveem specimens at 121 ± 3 °C (250 ± 5 °F) rather than the lower temperature specified previously for cold mix asphaltic concrete mixtures.
5	If the design mixture prepared in the laboratory or the mixture obtained from an asphaltic concrete plant contains aggregate larger than 22.4 mm (7/8 in.), separate the large size aggregate from the

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Step	**Action**
	sample by means of a 22.4 mm (7/8 in.) sieve.
6	Use the trowel to rub the material through the sieve and scrape off as much of the fines clinging to oversize particles as possible.
7	Preheat the mold and base plate in an oven at 121 ± 3 °C (250 ± 5 °F) for 15 ± 2 minutes or a minimum of 4 hours at 60 °C (140 °F).
8	For 'premixes,' heat the mold and base plate in an oven at the curing temperature for 3 to 4 minutes.
9	♦ Make certain that the platen is free to turn. ♦ Connect the motorized gyratory-shear molding press to an appropriate AC outlet, and push the reset and start buttons. ♦ Allow the press to go through one set of gyrations.
10	Remove the mold from the oven and wipe the inside lightly with a damp rag moistened with kerosene or light lube oil.
11	Insert base plate into mold with large diameter up, and place a paper gasket over base plate.
12	By means of the bent spoon and wide mouthed funnel, transfer the laboratory mixtures or a weighed quantity of plant-mixed material, heated to the proper molding temperature, into the mold.
13	♦ Select a mixture weight that when molded will yield a 50.8 mm (2 in.) specimen ± 1.5 mm (0.06 in.). ♦ Place approximately 1/3 of the mixture into the mold, taking care not to segregate the mixture.
14	With a sawing motion, move the small spatula around the inside of the mold, and then use the spoon to press the material down lightly.
15	Use the spatula to fill voids around the specimen with fine mixture particles.
16	Add another one-third of the material, using the spatula and pressing down with the spoon as before.
17	Place the remainder of the sample into the mold, again using the spatula, and level the surface of the specimen while pressing the material down.
18	Place a paper gasket on top of the mixture. Avoid loss of material and segregation of particles while placing the mixture into the mold. ♦ The vertical side of the specimen must be smooth to prevent damage to diaphragm of the stabilometer. ♦ Since the top and bottom surface need not be exceptionally smooth, do not arbitrarily place fine material on the bottom or top of the sample.
19	Quickly place a small amount of light-weight oil in the center of the motorized press platen and a drop or two on the surface of the lower bearing. (This is the bearing that 'cocks' the mold and creates the gyratory action.)
20	Squirt a small ring of oil around the periphery of the mold on the top surface of the hardened steel ring. ♦ This ring of oil must be in the path that the upper bearing will follow during gyration. Do not use an excessive amount of oil in making this ring. ♦ When molding a large number of Hveem specimens, Steps 19 and 20 must be repeated every 10 to 15 specimens or as appears necessary when wearing surfaces become dry.
21	Steps 19 and 20 must be done quickly without delay. Slide the hot mold and contents to the edge of the work table, and with gloved hand holding the base plate in place transport the mold to the platen of the press.
22	Slide the mold onto the platen and center it in molding position beneath the ram of the press.

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Step	**Action**
23	Move the lever on the control valve to the forward or positive position, and pump the ram down into the center of the mold.
24	Continue pumping until the low pressure gauge first registers 345 kPa (50 psi). It is normal for the pressure to immediately fall below 345 kPa (50 psi). ♦ Do not continue to apply pressure after the gauge has first registered 345 kPa (50 psi). ♦ No more than 3 minutes should pass from the time the mixture is removed from the oven to the time the initial 345 kPa (50 psi) is placed on the mixture.
25	♦ Immediately pull the handle of the cam-lever down to the horizontal position, cocking the mold to the proper angle of gyration. ♦ Be certain that the cam-lever is pulled all the way down. ♦ The pump handle must be all the way up.
26	♦ Push the reset button, then press and hold the start button. ♦ The mold will gyrate three times and stop. ♦ Hold the start button with the left hand while holding the pump handle in the uppermost position with the right hand. ♦ Should the start button be disengaged, molding press gyrations will cease. It will be necessary to again press the start button to complete the three gyration cycle. ♦ Keep hands away from the gyrating platen while in motion.
27	♦ As soon as the mold stops gyrating, immediately level the mold by raising the cam-lever handle to the vertical position with the left hand while making one full stroke of the pump handle with the right hand. These must be two smooth, consecutive motions. (The speed of the full stroke of the pump is important, for it serves as an end point for the procedure.) ♦ The proper speed of pump stroke is the speed which would allow one stroke per second.
28	Once again, apply pressure using the pump until the low pressure gauge first registers 345 kPa (50 psi), lower the cam-lever to the horizontal position, push the reset button, then push and hold the start button.
29	During molding, when one stroke of the pump handle causes the gauge to come to rest between 345 to 1034 kPa (50 to 150 psi), drop the pressure below 345 kPa (50 psi) by shifting the lever on the control valve to the unloading position and immediately returning it to the loading position.
30	Pump the pressure back to 345 kPa (50 psi). ♦ Experience has revealed that the smoothest operating procedure, and certainly the safest, is for the operator to always keep the right hand on the pump handle. The left hand must be used to operate the cam-level, the reset button, the start button and the control valve.
31	Continue Steps 25 through 30 until one smooth stroke of the pump handle, as described above, will cause the low pressure gauge to indicate a pressure of 1034 kPa (150 psi) or more.
32	When one full stroke of the pump causes the low pressure gauge to indicate to 1034 kPa (150 psi) or more, the gyrating portion of the molding procedure is complete.
33	At this end point of 1034 kPa (150 psi), bring the pump handle down slowly until the automatic gauge protector valve cuts the low pressure gauge out of the system.
34	Now, at approximately one stroke per second, pump the pressure up to 17,238 kPa (2500 psi), as measured on the high pressure gauge.
35	♦ As soon as the gauge registers 17,238 kPa (2500 psi), stop pumping with the right hand, and, with the left hand, very carefully release the pressure by slowly reversing the lever on the control valve to the backward position. ♦ Watch the large capacity gauge when releasing pressure to prevent damage to the low pressure gauge due to sudden, violent release of pressure.

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Step	**Action**
36	Pump the ram up and out of the mold.
37	Slide the mold out of the press, remembering to place a gloved hand beneath the mold to keep the base plate from falling out.
38	♦ Allow the base plate to drop out of the mold onto the work table. ♦ Invert the mold and remove the specimen from the mold with a converted arbor press or similar device.
39	Measure the height of the specimen. ♦ If the specimen is to be tested for Hveem Stability, the height must be 50.8 mm (2 in.) ± 1.5 mm (0.06 in.). ♦ If the height is not within this tolerance, discard the specimen and mold another specimen using the weight calculated from the formula listed at the end of this test method.
40	Clean the inside of the mold with a rag lightly moistened with kerosene or light lube oil before molding another specimen. ♦ It is critical that the motorized press be kept clean. If dirt or grit collect on the platen or hardened steel ring, wipe it off and re-oil it before molding the next specimen.
41	♦ When all the molding is completed, disconnect the press from the electric outlet, clean the unpainted parts of the press, the mold and base plate with a lightly moistened kerosene rag and coat with a thin coating of lightweight oil. ♦ This cleaning and oiling is an absolute necessity if the press is to continue functioning properly. Wipe the painted parts of the press with a clean, dry rag.

Lubrication Procedure

This process is essential to mold-press maintenance**.**

Mold Press Lubrication	
Step	**Action**
1	Remove the set screw from the center of the platen spindle top every three months and fill the reservoir with high-quality S.A.E. 30 weight hydraulic oil.
2	Periodically put several drops of high-quality S.A.E. 30 weight hydraulic oil in the two oil holes of the elevating roller.
3	Follow the lubrication instructions on the plate attached to the end of the electric motor.

Calculations

Use the following calculation to determine and adjust specimen height:

♦ Height Adjustment Formula

$$Required\ Weight\ (grams) = \frac{DW}{H}$$

Where:

- D = Desired height of specimen (50.8 mm [2.0 in.])

- W = Weight in grams of existing molded specimen
- H = Height in millimeters (or inches) of existing molded specimen.